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ABSTRACT

The booklet has been prepared to aid institutional personnel and others in publicizing the opportunities in engineering technology in North Carolina. With the expansion of industry in North Carolina there is a need for engineering oriented technicians. In relation to this need the document discusses the opportunities available for the engineering technician in North Carolina, the relationship of the engineering technician to the engineer, engineering technology curricula in North Carolina, educational experiences required for the engineering technician, continuing education possibilities for the engineering technician, job opportunities for the engineering technician, and accreditation of engineering technology programs. Four appendixes list engineering technology curricula, institutions in North Carolina offering engineering programs (by curriculum), suggested minimum admission requirements for candidates for engineering technology programs, and a resource list of additional information on engineering technologies. (BP)

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U.S. DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

Engineering Technology

CE002823

NORTH CAROLINA DEPARTMENT OF COMMUNITY COLLEGES
VOCATIONAL-TECHNICAL DIVISION

2

ENGINEERING TECHNOLOGY IN THE

NORTH CAROLINA COMMUNITY COLLEGE SYSTEM

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Assistant Director for the Engineering Technologies

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Graphic Arts Consultant

August, 1968

Revised
May, 1970

Revised
March, 1973

INSTRUCTIONAL LABORATORY
DEPARTMENT OF COMMUNITY COLLEGES
STATE BOARD OF EDUCATION
RALEIGH, NORTH CAROLINA

INTRODUCTION

The need for engineering oriented technicians is apparent as industry in North Carolina continues to expand and develop.

This booklet has been prepared to aid institutional personnel and others in publicizing the opportunities in engineering technology in North Carolina. This information, supplemented with facts about the local institution, may be utilized by instructors and administrators in talking to high school students, counselors, parents, civic groups, and other interested organizations about engineering technology. The artwork may be useful in stimulating audience reaction. One sketch per page allows transparencies to be made and used to illustrate particular points. Information contained herein may be of value for use in news releases, brochures, radio and TV advertisements. This booklet should help in providing information to high school students and others who wish to pursue careers in the field of engineering.

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THE ENGINEERING TECHNICIAN IS SKILLED IN THE USE OF TOOLS AND EQUIPMENT NEEDED FOR A TECHNICAL JOB.

ENGINEERING TECHNOLOGY IN THE

NORTH CAROLINA COMMUNITY COLLEGE SYSTEM

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OPPORTUNITIES FOR THE ENGINEERING TECHNICIAN

- There is, and will continue to be, a demand for engineering technicians in North Carolina.

  Industries' present needs are unfilled and there are future needs to be met. A recent study (Employment Outlook, Employment Security Commission) indicates the need for 6,600 additional engineering oriented technicians in industries presently in North Carolina over a three year period.

- Top industries are hiring engineering technicians as well as many local or "home loaned" industries.

  Industries who have hired engineering technicians from North Carolina include: Western Electric Corp., International Business Machines, R. J. Reynolds Tobacco Co., North Carolina State Government (largest employer in North Carolina) Olin Mathieson Chemical Corp., American Enka Corp., Celanese Corp., Southern Bell Telephone & Telegraph Co., General Electric, and many others.

- Engineering technicians make good money. Almost as much as engineers.

  Graduate engineering technicians in the institutions in 197[illegible], had starting salaries ranging from approximately $425 to $850 per month, depending on experience. Studies of engineering technicians made by the Engineering Manpower Commission of the Engineers Joint Council show that the median salary of graduate engineering technicians, in time, surpasses that of the lower 25 percent of graduate engineers.

- Engineering technicians advance on the job.

  With experience, engineering technicians become project directors, foremen, supervisors, technical writers, research engineering technicians, technical sales representatives, plant managers, machine

MEDIAN SALARIES OF ENGINEERING TECHNICIANS
BY LEVEL OF FORMAL EDUCATION
ALL SURVEY RESPONDENTS, 1969

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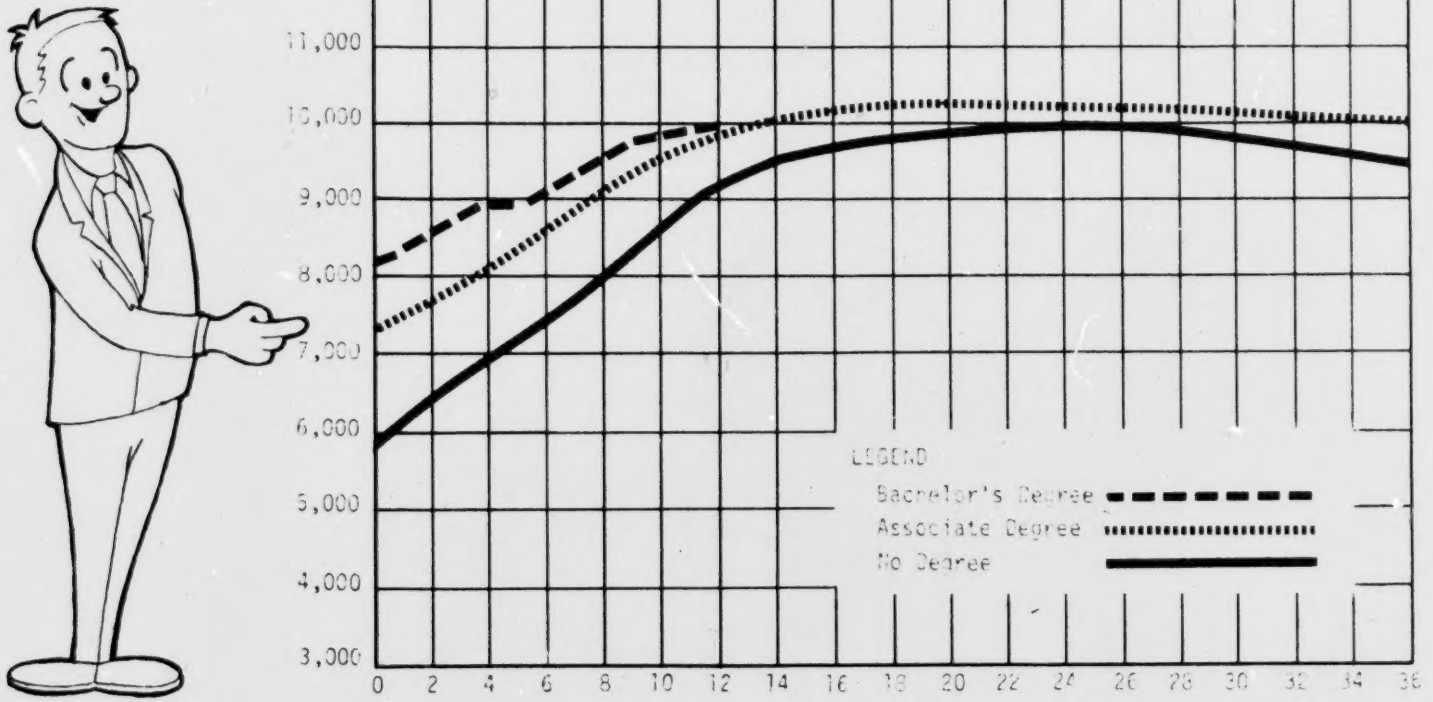

THE ENGINEERING TECHNICIAN DRAWS CHARTS AND GRAPHS.

designers, instrument technicians, dealers, and contractors. Some with experience and additional education, move into engineering positions.

- Engineering technicians are mobile because they are educated for a broad cluster of occupations.

  For example, the civil engineering technician may upon graduation become a highway engineering technician, a surveyor, a structural draftsman, an estimator, an inspector, civil technician, or a highway designer.

  The electronics engineering technician may begin work as an electronics technician, instrument technician, customer engineer, systems tester, communications technician, engineering technician, or in one of many other electronics oriented positions.

  The mechanical drafting and design student may begin work as a mechanical draftsman, estimator, mechanical technician, field representative, etc.

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THE ENGINEERING TECHNICIAN MUST UNDERSTAND THE ENGINEER'S LANGUAGE.

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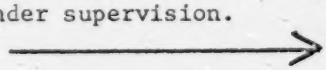
RELATIONSHIP OF THE ENGINEERING TECHNICIAN TO THE ENGINEER

- Engineering technology is that part of the technological field which requires the application of scientific and engineering knowledge and methods combined with technical skills in support of engineering activities; it lies in the area between the craftsman and the engineer in the part closest to the engineer.*
- Engineering technicians relieve engineers of many duties previously performed by engineers.
- Engineering technicians can begin work with a minimum of in-service education.
- Engineering technicians usually work under the direction of engineers.
- Engineering technicians with experience and additional education can become engineers (or move into other professional positions).
- Engineering technicians are not "unfinished" engineers. They have a definite place in the engineering spectrum.

THE SPECTRUM OF TECHNICAL JOBS °
Continuous Spectrum-Technicians

CRAFTSMAN AND SKILLED TRADESMEN	HIGHLY SKILLED (INDUSTRIAL) TECHNICIANS	SEMIPROFESSIONAL (ENGINEERING) TECHNICIANS	PROFESSIONALS-ENGINEERS AND SCIENTISTS
Production jobs requiring manual skills of a high order. Occasional need for technical knowledge. Repair, maintenance, and construction jobs.	Test, maintenance, and prototype production. Drafting, detailing checking, estimating. Manual skills required, but technical knowledge essential also. Use of instruments and gathering of data under supervision.	Research and design activities in support of engineers and scientists. May work individually. Some manual skills, but major emphasis is on technical knowledge.	Basic research and design. Direction of research and production activities. Emphasis is on knowledge, not skills. Working at the "frontier" of knowledge.



Toward increased complexity and intellectual content of the job demands

*Definition adopted by the Engineers' Council for Professional Development, 1968.

°From Harris, Norman C. Technical Education in the Junior College/New Programs for New Jobs.

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HE MUST UNDERSTAND FUNDAMENTALS OF MATHEMATICS.

ENGINEERING TECHNOLOGY CURRICULUMS

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- There are presently 17 curriculums classified as Engineering Technologies in North Carolina.

  Appendix A

- There are 104 programs being conducted in 39 institutions in North Carolina. (Fall, 1972)

  Appendix B

- There are about 3600 students in these curriculums across the state. (Fall enrollment, 1972).

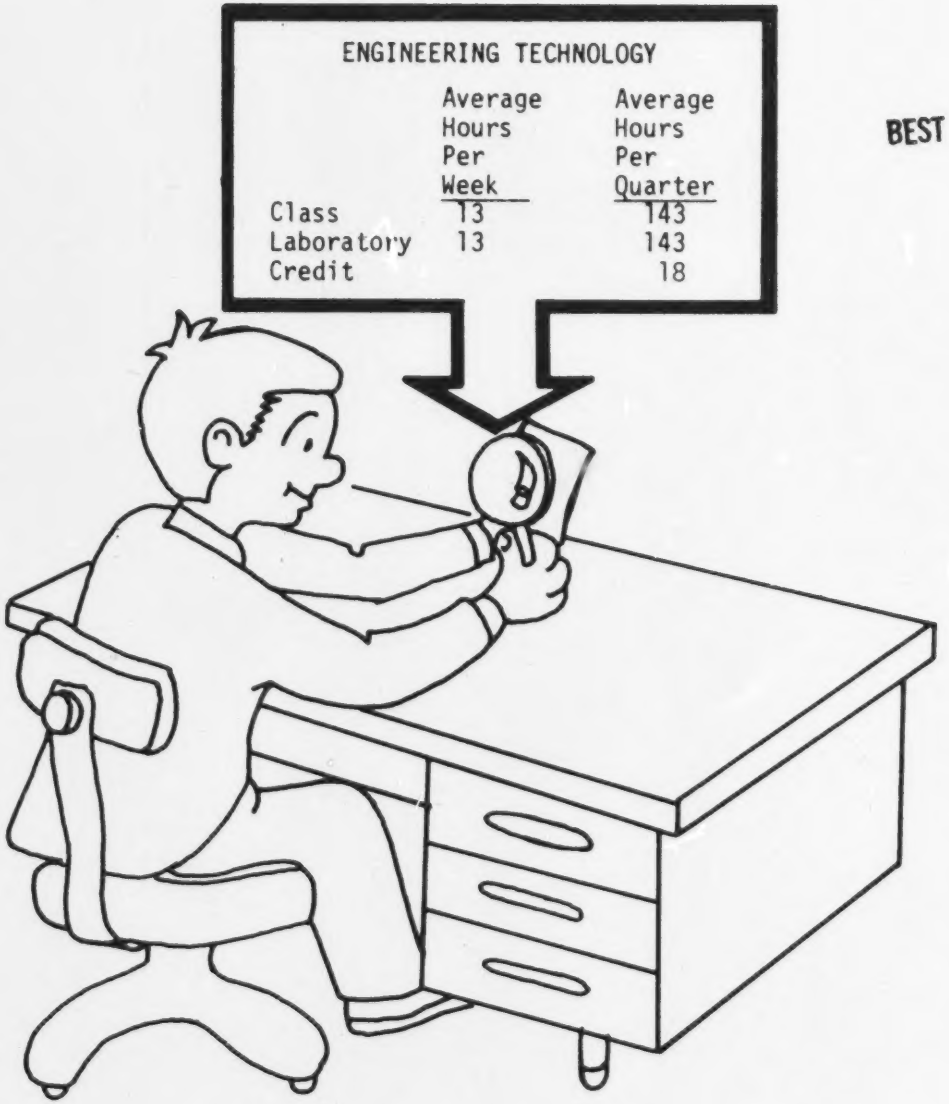
- The curriculums are designed to be a minimum of 108 hours in length (18 hours per quarter for six quarters) and can range to 120 hours in length.

- The student entering an engineering technology program should have a good background in math and science. Two units of math (Algebra and Plane Geometry) and one unit of science are suggested.

  Appendix C

- Deficiencies in basic high school courses can be removed through a developmental studies program, pretechnical courses, or use of the learning laboratory at the community college institution.

- An Associate in Applied Science Degree is granted upon completion of the Engineering Technology curriculum.



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THE ENGINEERING TECHNICIAN COLLECTS AND ANALYZES SAMPLES.

EDUCATIONAL EXPERIENCES OF THE ENGINEERING TECHNICIAN

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- Educational experiences of the Engineering Technology student are dictated by industry.

  Advisory committees, made up of industrial representatives and representatives from the institutions (who have been in contact with industry) develop each curriculum.

- Most curriculums are designed for a broad area within the engineering spectrum.

  For example, curriculums are offered in civil, electronics, mechanical, and industrial engineering technology. Through the educational experiences of a curriculum the student is prepared for a broad cluster of occupations.

- Generally, instructors for the specialty courses are engineers who have had experience in industry.

  Laboratory and shop courses are required in each curriculum. These provide exposure and practice in situations which the student might expect in industry. Many instructors conduct regular field trips or have guest speakers to speak to their classes on specialized topics of interest in the particular engineering field.

- Math, science, and English are called related subjects.

  The term related comes from the fact that these subjects are usually taught in relation to the needs in the specialty area of the student. By assigning problems, term papers, etc., related to specialty subjects these related subjects become a part of the whole and strengthen the specialty subjects.

- Co-op (cooperative) programs are being conducted in some of the institutions. This is another way of preparing the student for the world of work.

  In the co-op program the student includes as part of his educational experience a supervised work experience in industry in a job related to his program of study. This usually means

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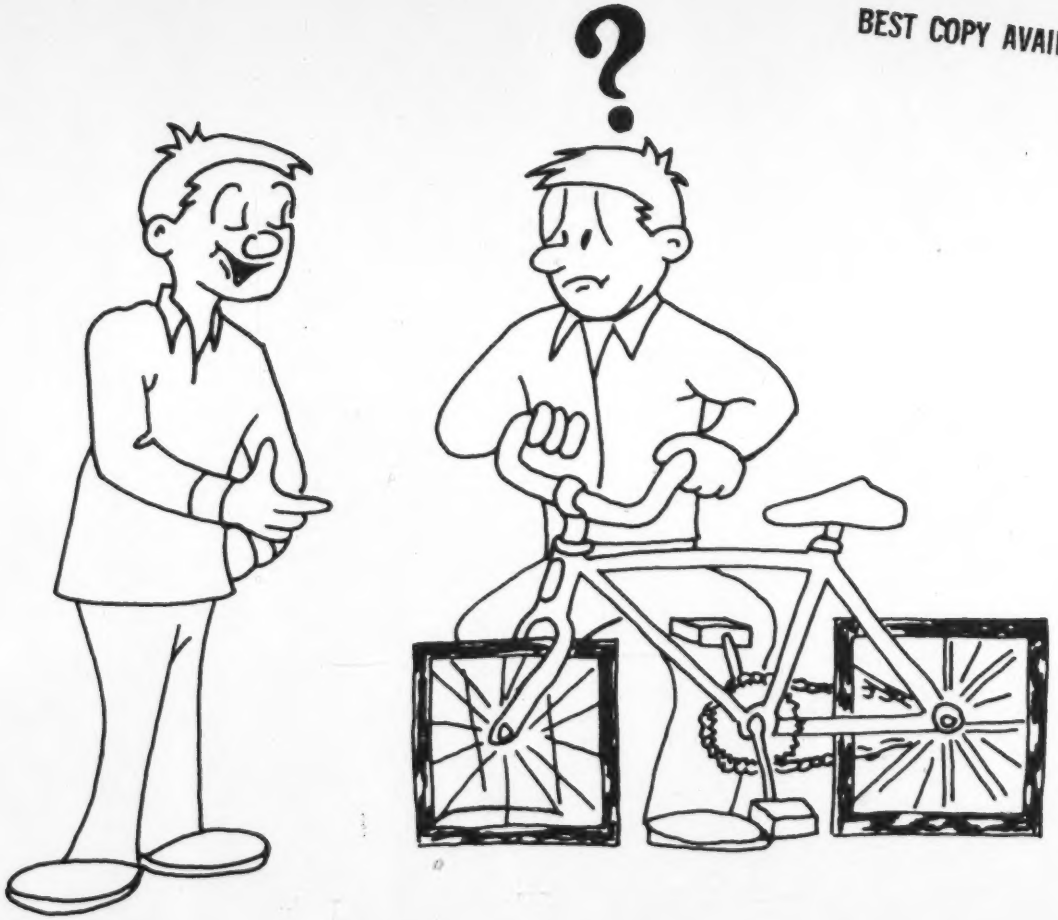

HE UNDERSTANDS MACHINE OPERATIONS.

working full-time during alternate quarters while enrolled in an Engineering Technology program. The co-op student is exempt from the draft for the full length of his educational program if he maintains good grades during this time.

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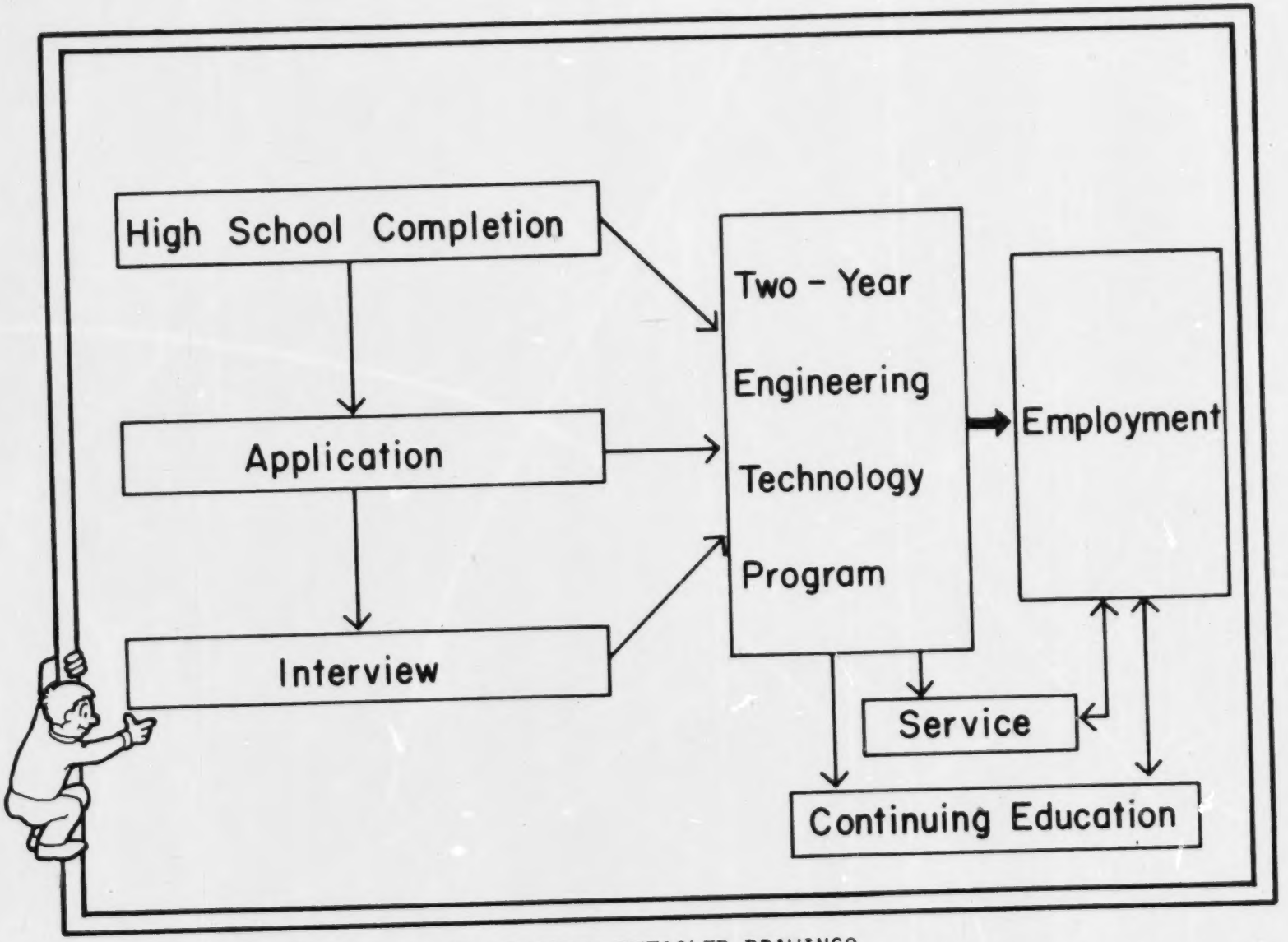

HE PREPARES DETAILED DRAWINGS.

CONTINUING EDUCATION FOR THE ENGINEERING TECHNICIAN

- Many graduates from the engineering technologies wish to continue their education upon graduating, or after they have worked a while.

- Many graduate engineering technicians wish to get a higher degree. Many, also, wish to continue their education in specialized subjects. This is a logical step for the student to want to take and is one which is supported by many employers financially.

- Schools across the country are now offering what is called a Bachelor in Engineering Technology or a Bachelor of Technology degree in which the student gets full credit for his two years in an engineering technology program toward a four-year baccalaureate degree.

- Several institutions in North Carolina are offering such programs. These institutions include the University of North Carolina at Charlotte, Appalachian State University, and East Carolina University.

- Technical institutes are finding that many of their graduates continue directly into these four-year programs on completion of the two-year program.

- Specialized extension courses can be offered for graduates in institutions when there is sufficient demand.

- Continuing education may lead to engineering status for the graduate. Also, engineering status may be obtained by the engineering technician through experience and promotions.

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THE ENGINEERING TECHNICIAN PERFORMS CALCULATIONS.

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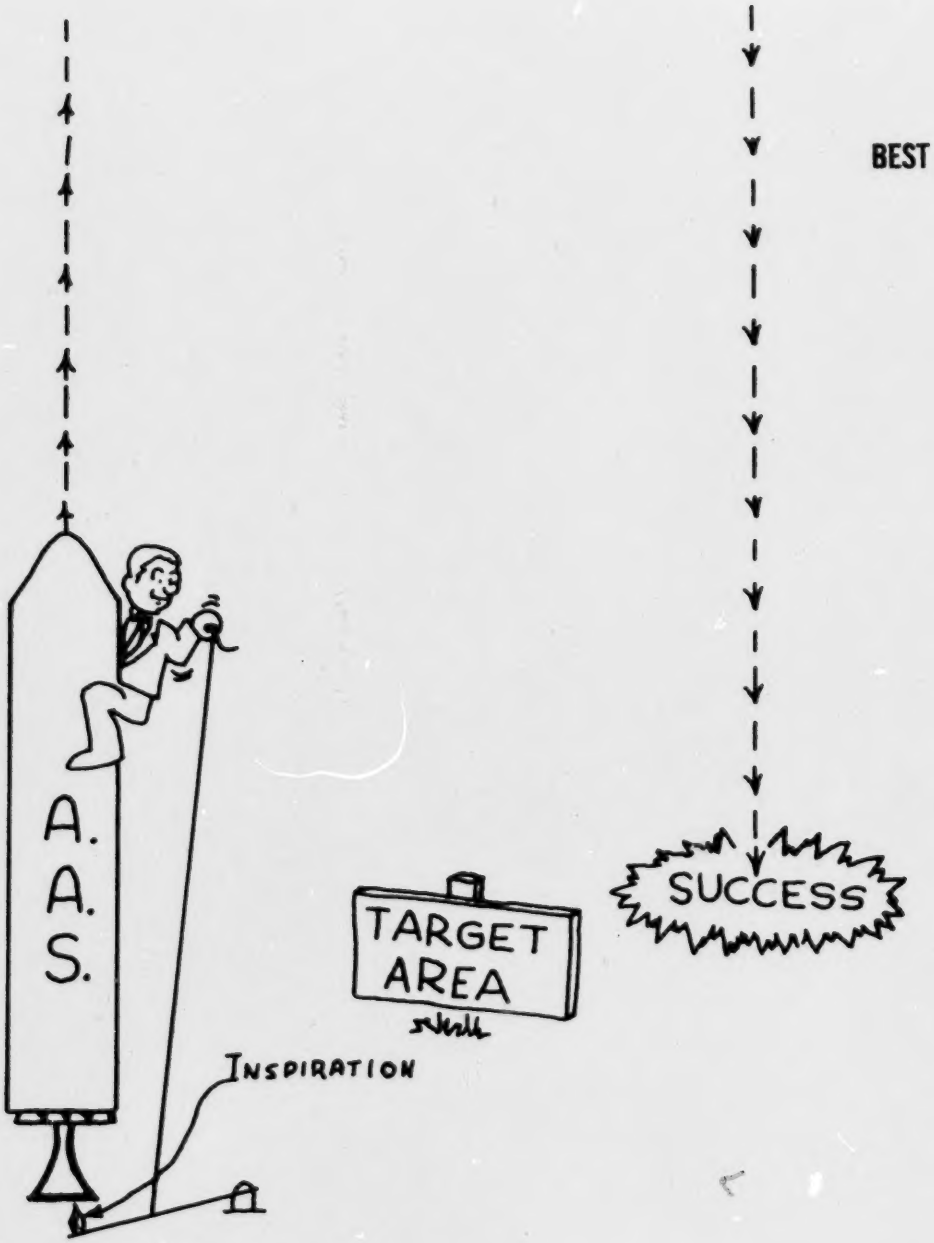

HE PERFORMS EXPERIMENTAL TESTS.

JOB OPPORTUNITIES FOR THE ENGINEERING TECHNICIAN

- The engineering technician is prepared for a job in a broad cluster of occupations upon graduating. Training is not narrow. He may go to work in a variety of jobs.

- Placement services are offered by most schools. Industries come on campus, in most cases, to interview second-year students for jobs.

- There are a variety of entry jobs held by engineering technology graduates of the community college system.

  Some of the job classifications are: Technician, Engineering Technician, Draftsman, Design Draftsman, Installer, Junior Designer, Estimator, Calibration and Test Technician, Lab Technician, Development Technician, Engineering Aide, Engineering Associate, Electronic Technician, and Production Planner.

- With experience, the engineering technician may move into other positions.

  Some job classifications of engineering technicians with experience are: Systems Designer, Customer Engineer, Technical Sales Representative, Research Assistant, Technical Writer, Plant Manager, Machine Designer, Research Assistant, Supervisor, Foreman, Construction Superintendent, and Assistant Production Manager.

- Entry salaries of engineering technicians vary widely, depending on location, demand, industry, and experience of engineering technicians.

  A recent survey of engineering technicians nationwide showed that graduates of engineering technology programs begin at a median salary of $7100, with the majority of them making between $6500 and $7600. (Salaries of Engineering Technicians, 1969.)

- Engineering technicians work for all types of industry as well as in government agencies, construction, consulting firms, research and development, public utilities, and transportation.

ACCREDITATION OF ENGINEERING TECHNOLOGIES

- Accreditation of Engineering Technology programs is something that is coming to North Carolina's institutions. Two accrediting agencies are presently working with institutions in North Carolina - Engineer's Council for Professional Development (ECPD) and Southern Association of Colleges and Schools.

  Five institutions presently have Engineering Technology programs that are ECPD approved--Fayetteville Technical Institute, Forsyth Technical Institute, Gaston College, Technical Institute of Alamance, and W. W. Holding Technical Institute. Others are working toward this accreditation. Most institutions offering Engineering technologies are Southern Association accredited.

- Accreditation means that the institution has been found to have a program which measures up to the minimum level set by the accrediting agency. Accreditation of a program does not necessarily mean that it is better than that of other institutions or of other programs within the same institution.

- ECPD accredits only Engineering Technology programs, and accredits by program. All Engineering Technology programs offered by the institution are not automatically approved.

- Southern Association accredits the institution. It is presently not concerned with accrediting specific programs.

- Accreditation of Engineering Technology programs and of institutions within the Department of Community Colleges is another way of assuring to the public that quality education is, and can be, conducted by the institutions of the Community College System.

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THE ENGINEERING TECHNICIAN CONSTRUCTS MODELS.

ADDITIONAL INFORMATION ON ENGINEERING TECHNOLOGIES

- A number of informative publications are available on Engineering Technologies. These have been listed for your information and use.

  See Appendix D

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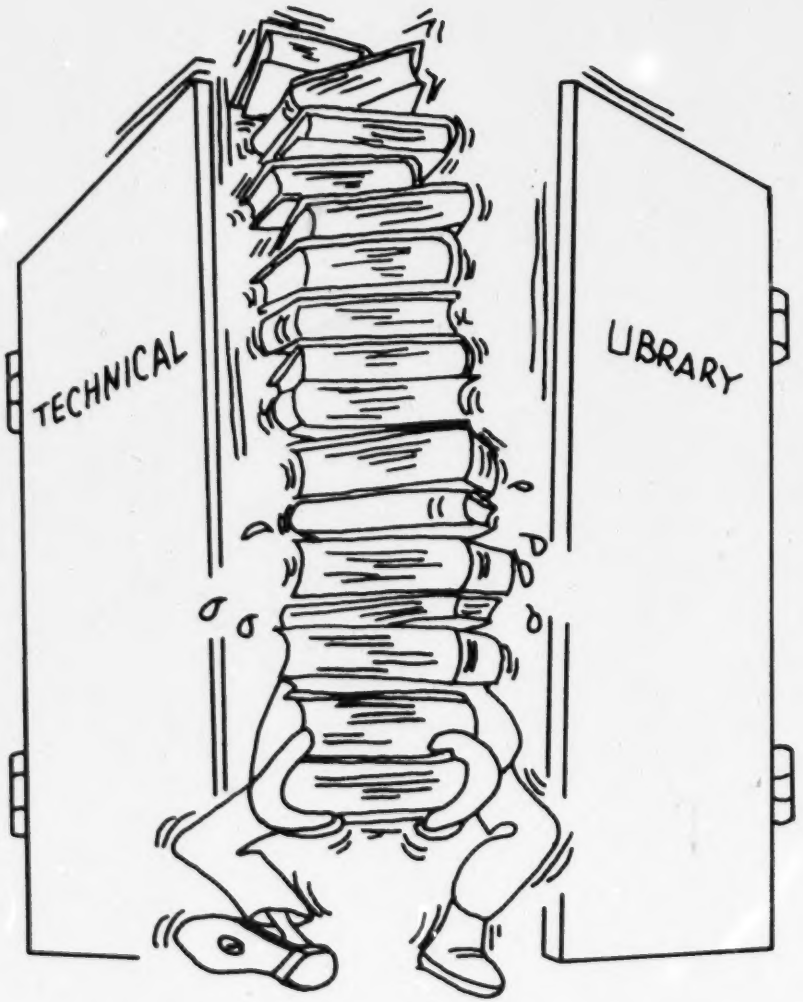

HE USES ENGINEERING HANDBOOKS.

APPENDICES

APPENDIX A

ENGINEERING TECHNOLOGY CURRICULUMS

Air Conditioning and Refrigeration Technology

Architectural Technology

Building Construction Technology

Chemical Technology

Civil Engineering Technology

Electrical Engineering Technology

Electronics Engineering Technology

Electromechanical Technology

Environmental Engineering Technology

Fire and Safety Engineering Technology

Furniture Drafting and Design Technology

Industrial Engineering Technology

Instrumentation Technology

Mechanical Drafting and Design Technology

Mechanical Engineering Technology

Manufacturing Engineering Technology

Plastics Technology

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APPENDIX B

INSTITUTIONS OFFERING ENGINEERING TECHNOLOGY PROGRAMS 1972
(by Curriculum)

AIR CONDITIONING AND REFRIGERATION TECHNOLOGY

Central Piedmont Community College
Fayetteville Technical Institute
Technical Institute of Alamance
Wilson County Technical Institute

ARCHITECTURAL TECHNOLOGY

Catawba Valley Technical Institute
Central Piedmont Community College
Coastal Carolina Community College
Forsyth Technical Institute
Guilford Technical Institute
Martin Technical Institute
Nash Technical Institute
Pitt Technical Institute
Roanoke-Chowan Technical Institute
Sandhills Community College
*W. W. Holding Technical Institute

BUILDING CONSTRUCTION TECHNOLOGY

Wilkes Community College

CHEMICAL TECHNOLOGY

Asheville-Buncombe Technical Institute
Cape Fear Technical Institute
Central Piedmont Community College
Technical Institute of Alamance
*W. W. Holding Technical Institute

*An ECPD accredited Engineering Technician Curriculum.

CIVIL ENGINEERING TECHNOLOGY

Asheville-Buncombe Technical Institute
Central Piedmont Community College
Coastal Carolina Community College
*Fayetteville Technical Institute
*Gaston College
Guilford Technical Institute
Sandhills Community College
*W. W. Holding Technical Institute

ELECTRICAL ENGINEERING TECHNOLOGY

Beaufort County Technical Institute
Central Piedmont Community College
Davidson County Community College
*Gaston College
Stanly Technical Institute
W. W. Holding Technical Institute

ELECTRONICS ENGINEERING TECHNOLOGY

Asheville-Buncombe Technical Institute
Cape Fear Technical Institute
Catawba Valley Technical Institute
Central Carolina Technical Institute
Central Piedmont Technical Institute
College of the Albemarle
Durham Technical Institute
*Fayetteville Technical Institute
*Forsyth Technical Institute
*Gaston College
Guilford Technical Institute
Halifax County Technical Institute
Isothermal Community College
Lenoir Community College
Pitt Technical Institute
Randolph Technical Institute
Richmond Technical Institute
Rowan Technical Institute
Southeastern Community College
Surry Community College
*Technical Institute of Alamance
Wayne Community College
Wilson County Technical Institute
*W. W. Holding Technical Institute

ELECTROMECHANICAL/COMPUTER TECHNOLOGY

Catawba Valley Technical Institute
Central Piedmont Community College
Lenoir Community College
*W. W. Holding Technical Institute

ENVIRONMENTAL ENGINEERING TECHNOLOGY

*Fayetteville Technical Institute

FIRE AND SAFETY ENGINEERING TECHNOLOGY

Rowan Technical Institute

FURNITURE DRAFTING AND DESIGN TECHNOLOGY

Catawba Valley Technical Institute

INDUSTRIAL ENGINEERING TECHNOLOGY

Catawba Valley Technical Institute
*Gaston College
Technical Institute of Alamance
Wayne Community College
Western Piedmont Community College
*W. W. Holding Technical Institute

INSTRUMENTATION TECHNOLOGY

Cape Fear Technical Institute
Roanoke-Chowan Technical Institute

MECHANICAL DRAFTING AND DESIGN TECHNOLOGY

Anson Technical Institute
Asheville-Buncombe Technical Institute
Caldwell Community College and Technical Institute
Cape Fear Technical Institute
Catawba Valley Technical Institute
Central Carolina Technical Institute
Central Piedmont Community College
College of the Albemarle
Davidson County Community College
*Forsyth Technical Institute

Guilford Technical Institute
Blue Ridge Technical Institute
Lenoir Community College
Richmond Technical Institute
Robeson Technical Institute
Rowan Technical Institute
Surry Community College
*Technical Institute of Alamance
Wayne Community College
Wilson County Technical Institute

MECHANICAL ENGINEERING TECHNOLOGY

Asheville-Buncombe Technical Institute
Central Piedmont Community College
*Fayetteville Technical Institute
*Gaston College

MANUFACTURING ENGINEERING TECHNOLOGY

Central Piedmont Community College
*Forsyth Technical Institute
Richmond Technical Institute
Wilson County Technical Institute

PLASTICS TECHNOLOGY

Caldwell Community College and Technical Institute
Edgecombe Technical Institute

APPENDIX C

SUGGESTED ADMISSION REQUIREMENTS - ENGINEERING TECHNOLOGY PROGRAMS

MINIMUM ADMISSION REQUIREMENTS

Requirements for admission of a candidate to the regular two-year Engineering Technology Programs include the following qualifications.

The candidate should:

1. Be a high school graduate or have a State-approved equivalent education.

2. Submit the transcripts of high school and post-high school education.

3. Have high school credit for two units of mathematics, one of which is algebra and the other in plane geometry or the equivalent of these in modern mathematics. One-half unit of trigonometry is desirable. Those who fail to meet the accepted standards for technical mathematics, as determined by appropriate tests, will be required to complete successfully a prerequisite mathematics course to remove the deficiency.

4. Recommended: The candidate should have completed one unit of science (beyond general science) with laboratory - physics, chemistry, biology, etc.

5. Demonstrate aptitude for technical training as determined by standard tests. These tests will aid in career guidance, educational planning, and appropriate course placement.

6. Be in satisfactory condition of physical and mental health. Medical examination may be required at the discretion of the administration in cases indicating need for medical opinion prior to a decision on admission and placement.

7. Have an interview with a designated representative for discussing enrollment plans and lifetime career goals.

APPENDIX D

ADDITIONAL INFORMATION ON ENGINEERING TECHNOLOGIES

- A Profile of the Engineering Profession. Engineer's Joint Council, 345 East 47th Street, N. Y., N. Y. 10017. $1.00.

- Counselor's Guide. Instructional Laboratory, North Carolina Department of Community Colleges, latest edition. Information on all curriculum programs conducted in the Community College System. Includes general information, curriculum descriptions, curriculums offered by each institution, institutions offering each curriculum, and identifies typical adult education, extension, and apprenticeship programs.

- Catalogs. General catalogs are available on request from most institutions within the Community College System for additional information about each institution.

- Certification of Engineering Technicians. Institute for the Certification of Engineering Technicians, 2029 K. Street, N.W., Washington 6, D. C. Brochure available on request.

- Characteristics of Excellence in Engineering Technology Education. American Society for Engineering Education. University of Illinois, Urbana, Illinois. Individual copies. 25¢.

- The Comprehensive Community College System in North Carolina. Department of Community Colleges, State Board of Education, Raleigh, North Carolina. 1968. Available on request.

- Engineering: Creating A Better World. Engineers' Council for Professional Development, 345 East 47th Street, N. Y., N. Y. 10017. 25¢.

- Engineering Technician, The. American Society for Engineering Education, 2100 Pennsylvania Avenue, N.W., Washington, D. C. 20037.

- Journal of Engineering Education. "Education of the Engineering Technician." Vol. 57, No. 3. American Society for Engineering Education, Washington, D. C. November, 1966. Single copies available for $1.00.

- Prospects of Engineering and Technology Graduates 1970. Engineering Manpower Commission of Engineers' Joint Council, 345 East 47th Street, N. Y., N. Y. 10017. $2.00.

- Salaries of Engineering Technicians, 1969. Engineering Manpower Commission of Engineers' Joint Council, 345 East 47th Street, N. Y., N. Y. 10017. $5.00.

- Salaries and Income of Certified Engineering Technicians, 1970. Engineering Manpower Commission of Engineers' Joint Council, 345 East 47th Street, N. Y., N. Y. 10017.

- Technical Education in the Junior College/New Programs for New Jobs. Norman C. Harris, Associate Professor of Technical Education, The University of Michigan. American Association of Junior Colleges, 1777 Massachusetts Avenue, N.W., Washington, D.C. 1964. $1.25.

- Technician Career Opportunities in Engineering Technology. Engineers' Council for Professional Development, the National Council of Technical Schools, and the Technical Institute Council of the American Society for Engineering Education. Individual copies, 50¢. Outlines basic information about the Engineering technician. Lists curriculums developed for training engineering technicians, jobs for recent graduates, and jobs for graduates with experience.

- The Technical Manpower Shortage: How Acute? (A Chart Essay) National Industrial Conference Board, 845 Third Avenue, N. Y., N. Y. 10022. $2.00.

- Trends in Engineering Technician Enrollments and Graduates. Engineering Manpower Commission of Engineers' Joint Council. 345 East 47th Street, N.Y., N.Y. 10017. July, 1967. $2.00.

- Film on Engineering Technology. The Connecticut State Department of Education has prepared a 16mm color film entitled " Technicians for Tomorrow," which presents the story of engineering technicians and their training at Connecticut technical institutes. The film is available on loan from Russell Capen, Room 355, Visual Aids Department, Connecticut State Department of Education, State Office Building, Hartford, Connecticut 06115.